

FIGHT'S ON!

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Distributed Mission Training Collaborative Briefing and Debriefing System

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Background

To effectively execute Distributed Mission Training (DMT) exercises over a wide-area network, players need to collaboratively plan, brief, and debrief with distributed team members. Just as in war, members of a team cannot meet at a certain location of the battlespace and conduct an effective mission without prior coordination and planning. Added to that, a great deal of learning that occurs in DMT exercises is in the debriefing, where lessons learned are extracted and shared.

Research and development (R&D) activities at the Air Force Research Laboratory, Human Effectiveness Directorate, Warfighter Training Research Division (AFRL/HEA) support critical pieces of effective training in a DMT environment with these objectives:

- 1.) Integrate technologies to allow sharing of digital voice, text, pictures, and drawings across wide-area networks, and where possible, maximize use of government and commercial off-the-shelf (COTS) technologies.
- 2.) Provide sharing of a common, synchronized plan-view display of the recorded DMT exercise with capability to discuss events and actions among distributed team members.



F-16 pilots emphasize training objectives in digital briefing.

- 3.) Develop and integrate methods and tools based on instructional principles to facilitate enhanced learning.
- 4.) Minimize bandwidth required for DMT exercises.

To support these R&D efforts, AFRL/HEA developed a prototype mission planning, briefing, and debriefing system using in-house software and COTS linked, interactive digital displays. The prototype system features include:

- SmartBoard® interactive whiteboards by SmartTechnologies™. These COTS displays and their supporting software act as a digital overlay that enables large touch-screen interaction and digital drawings in Windows-based software applications.
- Microsoft Netmeeting™ allows sharing and collaboration of

Windows applications and digital voice communication over computer networks.

- DMT Control Station (DCS). AFRL/HEA developed the DCS software to set up, control, view, and replay DMT exercises. The DCS has features that enable simultaneous logging and replay of scenarios at multiple DMT exercise sites, and works under both distributed interactive simulation (DIS) and high-level architecture (HLA) standards. Logging and replay can be accomplished via two different methods. The first is by sending remote commands to record and play back missions using multiple copies of the DCS at various DMT sites. The second method is by replaying all the recorded event packaged data units (PDU) across the network. While the first method is preferred because of the reduced bandwidth required, the second method provides effective backup.

Integration and User Tests

Engineering tests have focused on passing data between two sites: Mesa, Arizona and Brooks AFB, Texas. Test results demonstrated the capability to share drawings, voice, and data for briefings and debriefings, and the capability to remotely log and control synchronized replay. Further, existing

encryption devices were used for secure briefings and debriefings at the same time other virtual entities were flying in real-time. Bandwidth analysis showed the existing T-1 line was sufficient for concurrent exercise and debrief.

AFRL/HEA conducted tests of distributed, collaborative briefings and debriefings with a weapons director operating at Brooks AFB and a team of four F-16 pilots flying the DMT testbed in Mesa, Arizona. Team members were



F-16 pilots from Hill AFB discuss mission plans with Tinker AFB weapons controller.

conducting training in defensive and offensive counter-air missions, with up to 20 virtual and constructive aircraft, plus missiles, in the airspace.

Test Results

Overall, the tests proved to be a huge success. The system effectively provided the means to have secure, distributed briefings and debriefings for DMT team members at disparate sites. The “fifth man” of the team, the weapons director,

was able to view, listen, and interact with the F-16 four-ship team in all briefings and debriefings.

Throughout three days of testing, the F-16 flight leads prepared their mission briefing charts electronically using the SmartBoard® software and SmartNotebook® that acts like an electronic whiteboard. The SmartBoards in Arizona and Texas were connected and collaboratively shared the briefing charts at both sites over a secure T-1 line. Team members shared drawings between sites and discussed tactics and rules of engagement via NetMeeting™.

The weapons director at Brooks AFB and the pilots in the F-16 four-ship at Mesa Research Site (MRS) were able to view a synchronized replay of the DMT scenarios with the DCS software at both sites. This was demonstrated using identical log files at each site and by re-broadcasting the data.



Digital debrief system enables replay of four-ship sensor displays with synchronized plan view of engagements.

The tests also pointed out several technology, human factors, and procedural issues needing further R&D work.

Conclusion

Effective application of DMT requires more than interconnecting simulators in a common battlespace as warfighters must collaboratively plan, brief, replay, and debrief missions. AFRL/HEA's prototype DMT briefing and debriefing system has demonstrated the capability to support distributed training by integrating newly developed and COTS technologies. Future developments will improve usability and reliability of the system, thus enhancing the effectiveness of distributed training exercises.



DMT Testbed: Vipers 1 and 2 with video wall showing out-the-window and sensor displays from all four cockpits.

Targets of Opportunity

Mr. Simon Oldfield from **Defence Science and Technology Organisation**, Melbourne, Australia, visited Mesa to discuss potential collaboration on DMT-related activities, and AFRL/HEA participation in working group meetings to be held in Melbourne in Sep 01. Dr. Byron Pierce, Visual Systems Team Lead, traveled with him to WPAFB to meet with Dr. Ken Boff, Chief Scientist, AFRL/HE.

AFRL/HEA held a Phase II Small Business Innovative Research (SBIR) kickoff meeting with **SDS International**. This SBIR was awarded for development of a 20 megapixel PC-based image generator.

Over the next few months, a Phase I SBIR kickoff meeting will be held with **Chromulux, Inc.**, Titusville, FL, which is developing a fast write/erase LCD projection technology.

AFRL/HEA held Phase I and II SBIR kickoff meetings with **Physical Optics Corporation**. The Visual System Team will conduct Phase I for development of a helmet-mounted-display light engine, and Phase II involving development of a holographic collimating projection screen.

Dr. Byron Pierce and Mr. Phil Peppler, Visual Systems Leads, traveled to Quebec City and Toronto to meet with **Institute of National Optics (INO) and Defence and Civil Institute of Environmental Medicine (DCIEM)** personnel to discuss AFRL/HEA support of ultra-high resolution laser projector development activities in Canada. Plans are to invest approximately \$125K per year over the next three to five years for development of a spatial light modulator and support of a research chair position at the University of Waterloo. Both activities will be funded through subcontract with L-3 Communications Link Simulation & Training.

U.S. Navy Pilots Train at Mesa

Nine US Navy F/A-18 pilots and an E-2C controller participated in a first-ever Distributed Mission Training week, 20-24 August at Mesa Research Site, as part of their Strike Fighter Attack Readiness Program in preparation for a cruise on the carrier USS George Washington (CVN-73). The Hornet pilots trained with the E-2C controller while flying demanding four-ship missions over the Nellis Range Complex database against computer-generated air-to-air threats. Although the VFA-34 pilots had to overcome switchology differences between their F/A-18 aircraft and the F-16 simulators, they adapted quickly and effectively employed Hornet combat tactics against sophisticated multi-bogey, multi-group threats. Their performance attested to the effectiveness of VFA-34's training program in preparation for complex four-ship employment in a dynamic, hostile environment. The week at Mesa complemented their mission readiness preparation, particularly with multi-ship situational awareness, targeting standards, and communications skills.



VFA-34 pilots with E-2C controller on steps of Mesa Research Site.

Part-time Help With Full-time Impact

A vital component of DMT research and development is a cadre of subject matter experts (SME) who carry the stature that only attaches to someone wearing Air Force "green bags" or battle-dress uniforms. For this vital dose of credibility, AFRL/HEA turns to a staff of Air Force Reserve Individual Mobilization Augmentees (IMA) who represent a myriad of specialties. Qualified IMAs serve as air-to-air fighter operations SMEs evaluating mission briefings, mission execution, and mission debriefings during DMT multi-bogey, multi-group exercises, and provide critical insights for scientists and engineers developing the next generation of readiness training systems. The fighter SMEs mentor visiting pilots and generate mission performance data crucial to analysis efforts. Additionally, a weapons controller IMA works configuration updates to the Airborne Warning and Control System simulator station in the DMT testbed to enable visiting weapons controllers to provide support for visiting F-16 pilots in DMT scenarios. Other IMAs are employed in harvesting lessons learned in DMT-Air and are leveraging big dividends to expand capabilities for other warfighter domains, such as space, force protection, and command and control, including multi-crew high-value aircraft ops.



Briefs and Debriefs

Technical Cooperation Program

Subpanel Meeting. AFRL/HEA chaired the Technical Cooperation Program subpanel meeting in conjunction with the Conference on Computer Generated Forces and Behavioral Representation. The panel's title is *Improved Computer Generated Entities in Synthetic Environments*.

10th Annual Computer-Generated Forces and Behavior Representation Conference.

Dr. Kevin Gluck, Training Systems Technology Team, attended the 10th Annual CGF-BR Conference in Norfolk, VA. Dr. Gluck participated in a special double symposium on AFRL/HE's Agent-based Modeling and Behavior Representation (AMBR) Model Comparison Project. The symposium covered results from both Round 1 of the AMBR Model Comparison, which focused on multi-tasking models, as well as the more recent Icarus Federation development (AMBR Round 2).

AMBR Model Comparison Rounds 3 and 4 Model Team Selection.

The selection committee for Rounds 3 and 4 of the AMBR Model Comparison Project, composed of representatives from the Air Force, Navy, and DMSO met on 4 June. The committee selected two proposals to receive AFRL funding for Rounds 3 and 4. Contract awards are anticipated soon.

Worldwide Security Forces Symposium, Robbins AFB GA.

This annual conference includes topics of interest to all Security Forces personnel, including technologies, deployment concerns, training issues, and changes in policy and doctrine within the field. Capt Lorie Stump provided an overview briefing of

Security Forces Distributed Mission Training and other force protection training initiatives.

Delivery of Evans and Sutherland's Warlock High-Definition TeleVision (HDTV)

Laser Projector. Evans and Sutherland, Inc. delivered and set up an HDTV (1920 x 1080p) parallel scan, laser projector prototype to AFRL/HEA. The prototype is initially monochrome green, but as advanced lasers and modulators now in development become available, the prototype will be upgraded to full-color and ultra-high-resolution.



Mesa research team sets up laser projector prototype.

IMAGE Conference. The IMAGE Society conducted the "IMAGE 2001 Conference and Exhibition" at the Mountain Shadows Resort in Scottsdale, Arizona, from 9-13 July 01. This technical conference focuses on real-time visual simulation, related virtual reality technologies, and their applications. Technologies of interest

to the simulation and training community such as displays, environment modeling, sensors, real-time networks, and image generation were discussed in various special interest group meetings and presentations. AFRL/HEA hosted a tour of the Mesa Research Site for all interested IMAGE Conference attendees.

Window on Science Visitors.

Through the Window on Science Program, AFRL/HEA hosted Dr. Niels Taatgen of the University of Groningen, Netherlands, and Dr. Richard Young of the University of

Hertfordshire, England. Both are internationally recognized experts in cognitive modeling. The meeting allowed scientists to exchange information and explore collaborative arrangements regarding cognitive modeling basic research efforts between the Netherlands, UK, and the US.



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